
CHEMISTRY**9701/52**

Paper 5 Planning, Analysis and Evaluation

March 2017**MARK SCHEME**Maximum Mark: 30

Published

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Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Question	Answer	Marks
1(a)	external heat is being applied (from the Bunsen burner) OR the reaction is not taking place in a solvent/water OR it is impossible to know when reaction is complete	1
1(b)	M1 diagram indicating a labelled insulated container and a labelled thermometer in the liquid	1
	M2 temperature of mixture/HCl measured every minute	1
	M3 reactants mixed at 4 minutes	1
1(c)	5.3 °C	1
1(d)	M1 $q = 50 \times 4.18 \times 5.3 = 1107.7$	1
	M2 $\text{mol Na}_2\text{CO}_3 = 3.18/106.0 = 0.03(00)$	1
	M3 $\Delta H = -[1107.7/0.03]/1000 = -36.9$	1
1(e)(i)	to allow the acid to reach room temperature	1
1(e)(ii)	the reaction was not complete	1
1(f)	weighing by mass difference ensures that the exact mass of solid transferred is known	1
1(g)(i)	$(0.5/50 \times 100) = 1\%$	1
1(g)(ii)	HCl is in excess	1
1(g)(iii)	decrease the volume of HCl (aq) used OR increase the mass of the Na ₂ CO ₃ used	1

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Question	Answer	Marks
1(h)	M1 two lines one (horizontal) before 4 minutes and one starting below the first line after 4 minutes	1
	M2 second line shows an increase in temperature and does not increase above the first line	1
1(i)	M1 use of $2 \times 24.2 = 48.4$	1
	M2 $2 \times 24.2 - (-36.9) = (+) 85.3$ /correct cycle	1

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Question	Answer	Marks
2(a)(i)	M1 mol of $\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$ needed = $0.05 \times 100/1000 = 0.005(00)$ mol	1
	M2 $0.0005 \times 403.8 = 2.02$ g	1
2(a)(ii)	M1 <i>dissolving of solid/ making of a solution</i> dissolve (2.02 g/answer to 2(a)(i)) of hydrated salt in (a container with) distilled water/less than 100 cm^3 of water	1
	M2 <i>making it into a standard solution</i> (transfer/ add to) a (100 cm^3) volumetric flask; make to mark(with (distilled) water) (and shake)	1
2(b)(i)	M1 all points plotted	1
	M2 two lines which are extrapolated to meet	1
2(b)(ii)	correct reading of volume of Fe^{3+} and volume of 2-hydroxybenzoate ions from graph combined to make 10.0 cm^3 (expected values: $\text{Fe}^{3+} = 3.3 \text{ cm}^3$; 2-hydroxybenzoate = 6.7 cm^3)	1
2(b)(iii)	2	1
2(b)(iv)	$[\text{Fe}(\text{H}_2\text{O})_2(\text{HO}-\text{C}_6\text{H}_4-\text{CO}_2)_2]^+$	1
2(b)(v)	burette(s)	1
2(c)	$23 \pm 1\%$	1
2(d)	$\text{dm}^3 \text{ cm}^{-1} \text{ mol}^{-1}$	1